

## 12.47 kV SYSTEM: PROTECTIVE RELAYS INFORMATION PROCEDURE

### APPLICATION

For use by Facilities Division electricians. This procedure is part of the operations manual for the 12-KV power system. See ADMN-056 for an overview of the manual's contents, including related procedures. This procedure should be carried out ONLY by a qualified electrician who has been instructed and trained to work on the 12.47 kV system. Any Facilities personnel performing this procedure must be familiar with the general operating and information procedures regarding this system.

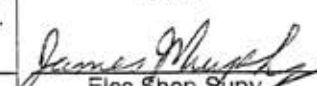

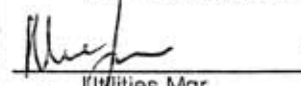
### PURPOSE

To provide names, numbers, and description of the protective relays used in LBNL's 12.47 kV power system.

| PROTECTIVE RELAYS DESCRIPTION |   |   |
|-------------------------------|---|---|
| NAME                          | ACTION  | DESCRIPTION   |
| Phase Overcurrent (50/51)     | Opens on high current condition due to overload or short circuit.   | <p>This relay will open a circuit breaker and is composed of two elements.</p> <p>Instantaneous element trip (50) indicates that a fault has occurred somewhere on the feeder.</p> <p>Time Overcurrent element trip (51) indicates that a sustained overcurrent or short circuit condition existed which caused the relay to operate. The instantaneous element may have been disabled for better upstream relay coordination.</p> <p>High-potting or other tests should be performed to isolate and clear any suspected short circuit before reclosing a breaker after a trip.</p>   |
| Ground Overcurrent (51N)      | Opens on a ground current condition on the system feed from the breaker.  | The relay has a time overcurrent element and is generally set to coordinate with a downstream instantaneous ground fault relay. Tests should be performed to isolate and clear any ground fault before reclosing a breaker after a Ground Overcurrent relay trip.   |
| Zero Sequence Ground (50GS)   | Opens on a ground current condition on a system feeder due to equipment or cable failure.   | This relay has an instantaneous element and will operate on a very low value of ground fault current. Tests should be performed to isolate and clear any ground fault before reclosing a breaker after a Zero Sequence Ground relay trip.   |
| Bus Differential (87B)        | Operates when an unbalance exists between current entering and current leaving the protected zone.  | <p>This condition indicates that a fault has occurred somewhere in the zone causing the differential to open all circuit breakers in the zone.</p> <p>At Grizzly Substation, there are two Bus Differential zones. Each zone includes the Main Breaker, all Feeder Breakers on a bus, and the Tie Breaker.</p>  |
| Lockout Relay (86)            | Prevents the reclosing of a circuit breaker until a qualified electrician has performed an inspection to determine the cause of the protective relay operation. | <p>This high speed electrically operated switch is activated by a protective relay, and has a contact in the circuit breaker Trip circuit. The Lockout Relay must be reset before the breaker can be reclosed. A qualified electrician must perform an inspection to determine the cause of the protective relay operation, testing the circuit if necessary, and obtain approval from Planning, Design &amp; Construction before re-energizing.</p> <p>Lockout relays are applied to:</p> <ul style="list-style-type: none"> <li>• Bus Differential.</li> <li>• Ground Overcurrent.</li> <li>• Phase Overcurrent.</li> </ul> |

### RESPONSIBILITIES AND CONTROLS

Completion of the following signature lines constitutes approval of this procedure:

| REV NO. | SME   | REVIEWED BY   | APPROVED BY / DATE  | REVISION DATE |
|---------|---|---|---|---------------|
| 2       | <br>Elec Shop Supv | <br>Chief Elec Eng | <br>Utilities Mgr | 5/10/07       |
|         | James Murphy<br>(Print Name)  | LAWRENCE D. DOMANSKY<br>(Print Name)  | MARTIN JOHNSON<br>(Print Name)  | INFO-048      |